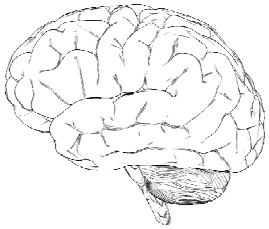
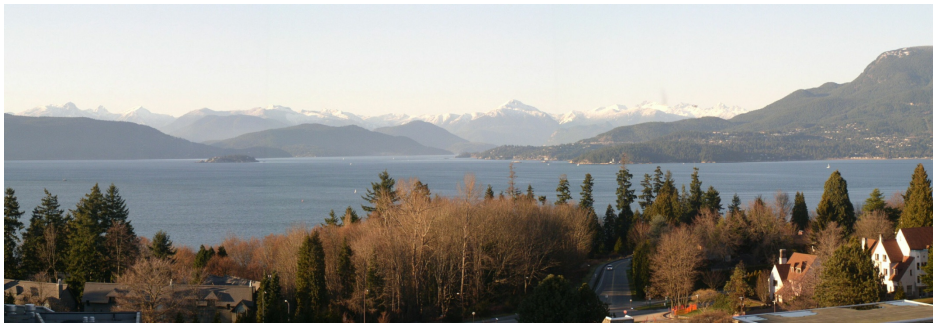
Psychology 101

Intro Bio Cog Psych
University of British Columbia
Dr. Michael Souza



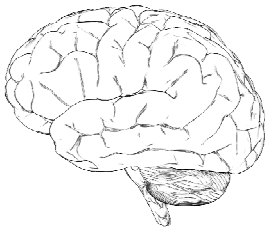
Lecture 07a (30 May 2012)
Continue Lecture 06c (introduction to memory)

Please note: this lecture contains graphic pictures of the brain and of blood



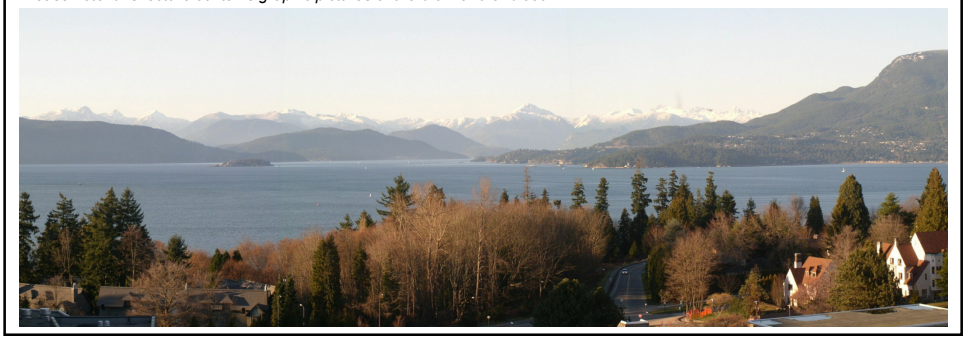
Psychology 101

Intro Bio Cog Psych
University of British Columbia
Dr. Michael Souza



Lecture 07b (30 May 2012)
Biological foundations of memory

Please note: this lecture contains graphic pictures of the brain and of blood

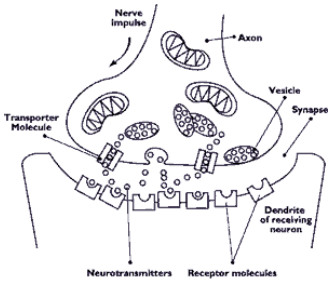


The biological basis of memory creation

"Neurons that fire together, wire together"
Donald Hebb (1904-1984)

Long-term potentiation
Enhanced neural processing that results from the strengthening of synaptic connections

NMDA receptors and glutamate



3

Picture: http://wiki.answers.com/Q/Is_there_A_labelled_diagram_of_a_synapse

Limbic system: the amygdala

Normally:

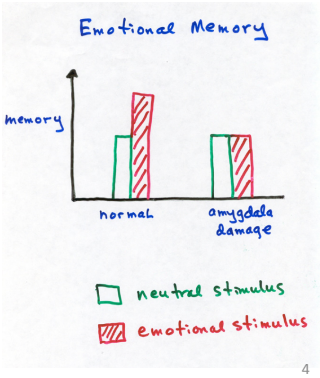
Increased activity to fearful stimuli

Memory for emotional events correlates with degree of amygdala activation

Beta-blockers eliminate the emotional memory boost

The lesioned amygdala:

Impaired fear conditioning and perception
Decreased memory for emotional events



4

Patient H.M. (1926 - 2008)

Seizures since age 10

Removal of his medial temporal lobes (MTL) bilaterally (incl. hippocampus)

After-effects of the surgery
Scoville & Milner (1957)

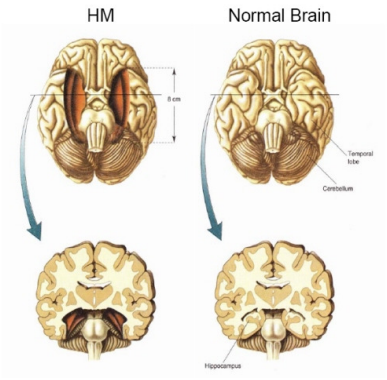


Image: http://www.telegraph.co.uk/news/obituaries/4109336/Henry-Molaison.html
http://scienceblogs.com/neurophilosophy/2007/07/remembering_henry_m.php

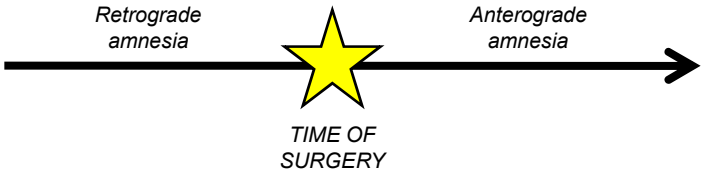
5

Post-surgery H.M.

Profound anterograde amnesia

Partial retrograde amnesia (temporally graded)

Short-term memory and intelligence *intact*



6

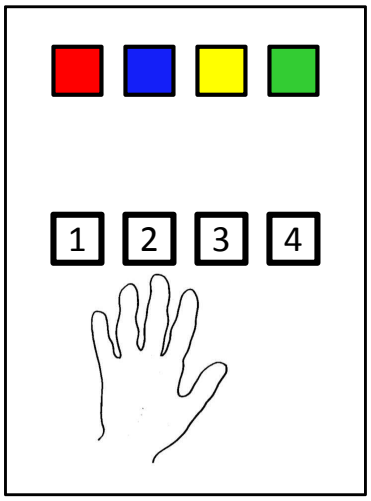
Completely unable to create new memories…?

New memories in H.M.?

He can learn some things:

Mirror-tracing task

Sequence learning



7

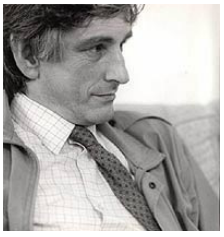
Image: http://e-book.lib.sjtu.edu.cn/iupsys/Proc/Bruss1/bpv1ch01.htm

The case of Clive Wearing

Arguably the most severe memory patient in recorded history

Damage caused by Herpes Simplex Encephalitis (virus)

Profound retrograde amnesia, anterograde amnesia…



8

Image: http://www.telegraph.co.uk/health/3313452/The-man-who-keeps-falling-in-love-with-his-wife.html
http://medicalcases.wordpress.com/author/irinaark/

Where are memories represented in the brain?

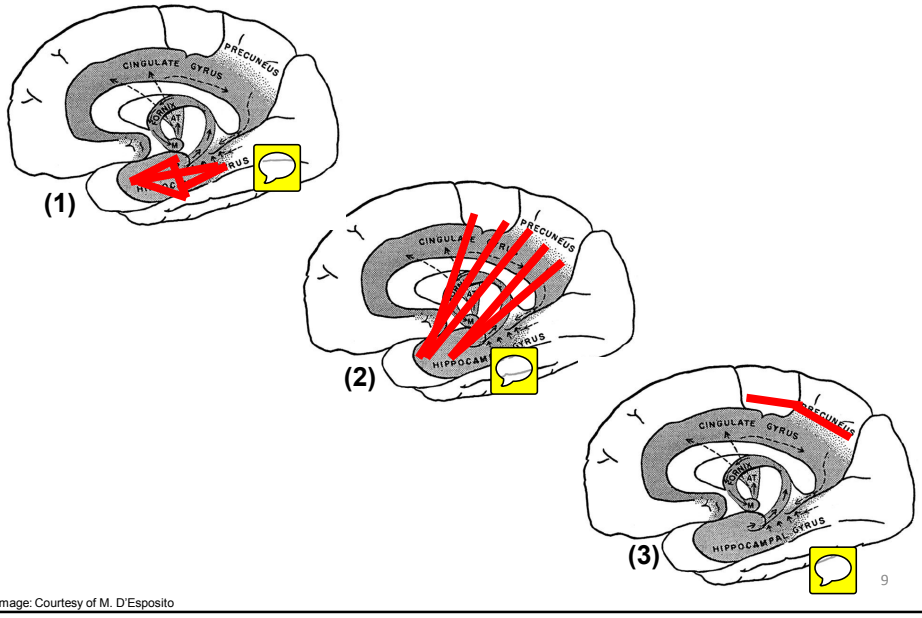


Image: Courtesy of M. D'Esposito

9

Interim section summary

The limbic system contains a set of structures that are critical for emotional and memory processing.

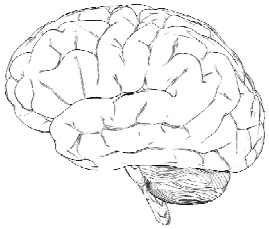
Loss of memory (amnesia) may result from damage to limbic structures (except the amygdala).

LTP appears to be the neurobiological mechanism for memory and memories appear to be consolidated over time from the hippocampus to the cortex.

10

Psychology 101

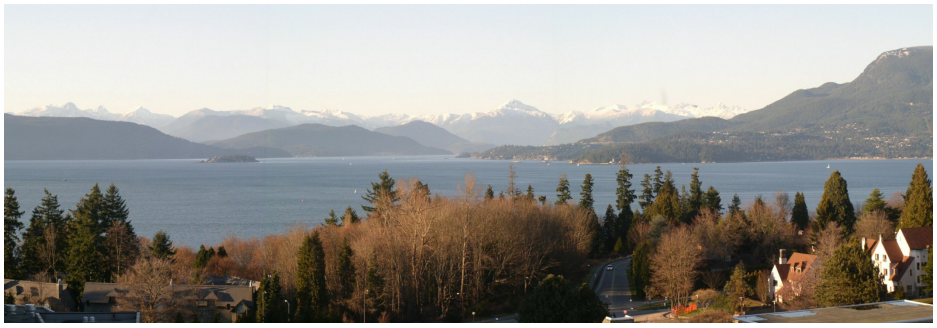
Intro Bio Cog Psych
University of British Columbia
Dr. Michael Souza



Lecture 07c (30 May 2012)

A brief introduction to Alzheimer's disease

Please note: this lecture contains graphic pictures of the brain and of blood



Causes of dementia

Infection (AIDS, Neurosyphilis)

Metabolic (Vitamin B deficiency)

Trauma (repeated head trauma)

Vascular (diabetes, hypertension)

Neurodegenerative
Huntington's disease
Alzheimer's disease

12

Picture: http://topnews.us/content/24615-alzheimers-association-report-gives-facts-and-figures-about-alzheimer-s-disease

Alzheimer's disease

Dr. Alois Alzheimer (1906)

Cognitive deficits
Memory loss: anterograde/retrograde
Language: anomic, empty, circumlocutory
Visuospatial

Behavioral deficits
No significant early changes in personality
"Sundowner syndrome"
Lack of awareness and denial
Psychosis

No sensory or motor deficits

Age of onset: 70's and older
…but there is "early onset"

14

Picture: http://whiteplains.lohudblogs.com/2010/07/18/alzheimers-patients-paint-at-burke-rehab/

Stages of AD

Very early
Amnestic mild cognitive impairment (MCI)

Mild
Memory troubles intensify
Confusion and impaired basic skills
Impaired judgment
Subtle mood and personality changes

Moderate
Language, reasoning and conscious thought
Impaired learning, increased confusion
Psychosis

Severe
Impaired communication

15

Picture: http://www.azalz.org/Alzheimers-Disease/Overview.aspx

Mini-Mental State Examination (MMSE)

Patient's Name: _____ Date: _____

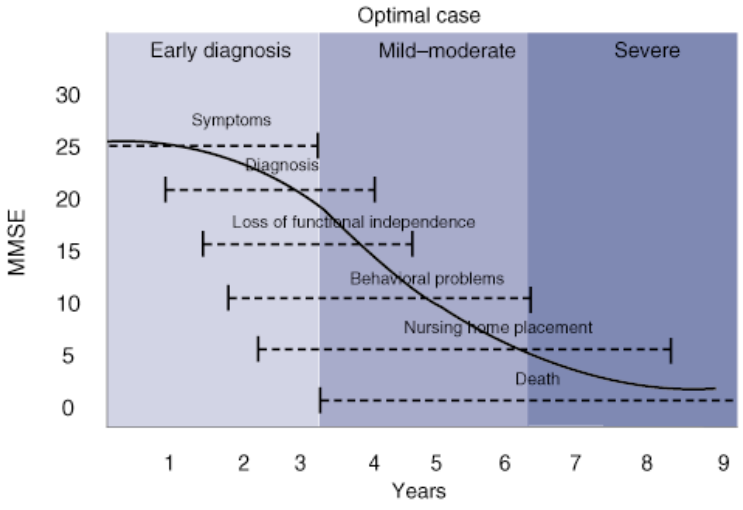
Instructions: ***Ask the questions in the order listed. Score one point for each correct response within each question or activity.***

Maximum Score	Patient's Score	Questions
5		"What is the year? Season? Date? Day of the week? Month?"
5		"Where are we now: State? County? Town/city? Hospital? Floor?"
3		The examiner names three unrelated objects clearly and slowly, then asks the patient to name all three of them. The patient's response is used for scoring. The examiner repeats them until patient learns all of them, if possible. Number of trials: _____
5		"I would like you to count backward from 100 by sevens." (93, 86, 79, 72, 65, ...) Stop after five answers. Alternative: "Spell WORLD backwards." (D-L-R-O-W)
3		"Earlier I told you the names of three things. Can you tell me what those were?"
2		Show the patient two simple objects, such as a wristwatch and a pencil, and ask the patient to name them.
1		"Repeat the phrase: 'No ifs, ands, or buts.'"
3		"Take the paper in your right hand, fold it in half, and put it on the floor." (The examiner gives the patient a piece of blank paper.)
1		"Please read this and do what it says." (Written instruction is "Close your eyes.")
1		"Make up and write a sentence about anything." (This sentence must contain a noun and a verb.)
1		"Please copy this picture." (The examiner gives the patient a blank piece of paper and asks him/her to draw the symbol below. All 10 angles must be present and two must intersect.) 
30		TOTAL

16

Image courtesy of M. D'Esposito

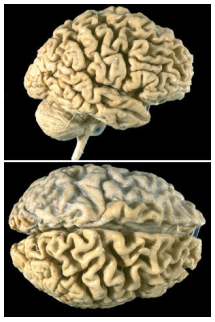
Typical progression of Alzheimer's disease

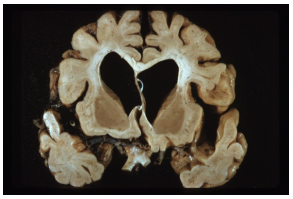


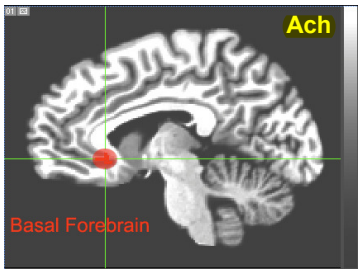
17

Image courtesy of M. D'Esposito

Anatomical and neurochemical changes in the brain





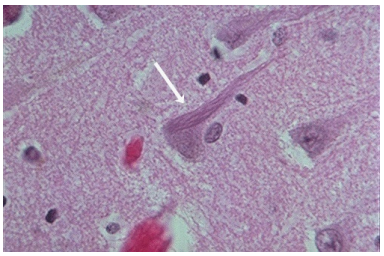


18

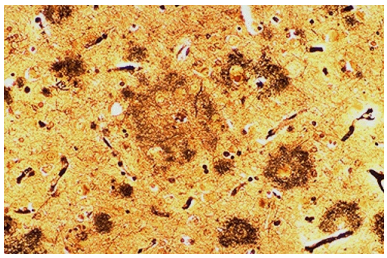
Image courtesy of M. D'Esposito and http://en.wikipedia.org/wiki/Basal_forebrain

Biological changes: pathology of Alzheimer's

Neurofibrillary tangles



Beta-amyloid plaques



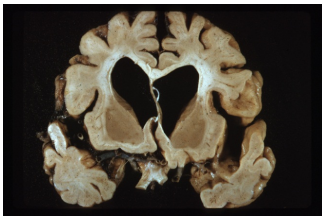
Picture: http://library.med.utah.edu/WebPath/CNSHTML/CNS094.html
http://www.macalester.edu/academics/psychology/whathap/ubnrp/alzheimer/plaquepic.html

19

Section summary

Alzheimer's disease is the most common form of dementia. It causes severe memory and other cognitive impairments

Understanding the biological changes associated with AD will help us find better treatments and perhaps even a cure.



20

Next class: Midterm Examination 2 (BRING A PENCIL!)